

REMARKS

Claims 1-5 are pending. Claim 1 has been amended to overcome the 35 USC 112 rejection and not to overcome the prior art. The amendment to claim 1 does not alter the scope of the claim. No new matter is presented.

Applicants wish to thank the Examiner's Supervisor Mr. Paul Ip for conducting an interview in this case.

Claims 1-5 are rejected under 35 USC 112, second paragraph as being indefinite, vague and confusing. The Examiner asserts that claims 1 and 2 recite "insufficient means, structure and relationship in conform the semiconductor device having a given property." During the examiner interview, Supervisory Examiner Ip explained that the claims were being analyzed under 35 USC 112, sixth paragraph, since they recite "step for." Therefore, the claims were being rejected because they do not recite the structure necessary to perform the claimed steps. Applicants have amended claim 1 to remove this phrase since the claims were never intended to be step-plus-function claims. Since claim 1 is a method claim, not a step-plus-function claim, it does not need to recite any structure.

Claim 1 recites a process for manufacturing a semiconductor laser device. This process may employ structure which is well known in the art, such as the structure needed to apply the conductive die-bond past onto the base portion (claim 1), but the process itself is not vague or indefinite and the claim need not include the structure used to perform the method, since that is not what is being claimed. A method claim which does not recite any structure is not indefinite. In fact, the Applicants respectfully submit that the process claimed in claim 1 is new and novel in light of the cited references (as will be discussed later). It is evident from the recitation in claim 1 that, in the process of manufacturing a semiconductor laser device, it is the extra operation of temporarily curing the conductive die bond paste by keeping it pressurized, before the operation of finally curing the paste, which makes this invention distinct over the prior art. It is unnecessary to recite the specific structure used to apply the paste, or to mount the chip, since these are well known and do not render the claim vague or indefinite. A claim such as claim 1 is

the very definition of a method claim and the recitation of structure is unnecessary to allow one of ordinary skill in the art to realize and understand the metes and bounds of the Applicants claimed invention.

Supervisory Examiner Ip also indicated that he believed that the feature of claim 2 “wherein thermal resistance of the semiconductor laser device is 90° C/W or lower” is merely a recitation of a result or functional limitation. The Examiner stated that he believed that the same held true for the remaining claims which recite “wherein” clauses. Applicants respectfully disagree. As a rule, there is nothing inherently wrong with defining some part of an invention in functional terms. Functional language does not, in and of itself, render a claim improper. In re Swinehart, 439 F.2d 210, 169 USPQ 226 (CCPA 1971). Therefore, if the Examiner is taking the position that any claim recitation which follows “wherein” is inherently indefinite, Applicants must respectfully disagree. Furthermore, each one of the wherein clauses recited in the claims are followed by limitations which clearly further limit the invention in terms of the characteristics of the device which is formed by the claimed method. These claims do not merely recite results or functions as suggested by Supervisor Ip. However, even if the Examiner deems that these limitations are merely functional, this is not a proper basis for rejecting the claims under 35 USC 112, second paragraph.

Accordingly, Applicants respectfully request that this rejection be withdrawn.

Claims 1 and 2 were rejected under 35 USC 102(b) as being unpatentable over Inaba (U.S. Patent No. 6,255,742). This rejection is respectfully traversed.

The Examiner states that Inaba discloses a semiconductor laser device having a semiconductor laser chip mounted on a base portion using electrically conductive die-bond paste (citing col. 8, lines 62-67), where thermal resistance of the semiconductor device is 90° C/W or less (citing Col. 7, Table 1). The Examiner then states that since Inaba discloses the device produced by the claimed process, claim 1 is inherently anticipated by Inaba. Applicants respectfully disagree.

Inaba relates to a Si-LSI mounted as a package and not to a semiconductor laser to which the present invention relates. Inaba only discloses a semiconductor bonded on a heat dispersion plate with a resin. The heat dispersion plate is made of a 0.1-0.2 mm thick copper alloy having a thermosetting resin thereon. Thus, Inaba does not disclose applying the conductive die-bond paste, only a thermoplastic resin.

Further, Inaba fails to disclose temporarily curing the paste by heating and pressurizing, or finally curing the paste. For example, Inaba discloses that the thermoplastic resin is heated, thereby bonding the island 2 and heat dispersion plate 7 together (col. 9, lines 33-35). Inaba does not, however, disclose heating the semiconductor laser chip mounted on a base portion while the chip is kept pressurized toward the base portion. In fact, Inaba states that the method of securing the semiconductor element 1 to the island 2 are the same as in the prior art. Thus, the Examiner has failed to provide a reference which bonds the semiconductor laser chip to the base portion in the claimed manner. Inaba also fails to disclose that there are two curing steps, as claimed in claim 1 and does not even suggest that this feature is well known in the art. Accordingly, Applicants respectfully submit that Inaba fails to disclose or suggest the features of claims 1 or 2. Applicants request that this rejection be withdrawn.

Claims 3 and 4 are rejected under 35 USC 103(a) as being unpatentable over Inaba. This rejection is respectfully traversed.

The Examiner asserts that Inaba discloses the amount of die-bond surface of the semiconductor laser chip (citing col. 8, lines 62-67 and Col. 0-60 [sic]). The Examiner then asserts that it is known that when one pushes a chip onto the die-bond paste toward the base, there will be some amount of creep-up and determining the proper range involves only routine skill. Applicants respectfully disagree.

First, Inaba does not actually disclose a conductive die-bond paste. Furthermore, Inaba merely discloses, at col. 8, lines 62-67, the plate made of 0.1-0.2 mm thick copper alloy and does not disclose the creep-up height of the die-bond paste in any range nor the claimed thickness of (5 μ m) in claim 5.

Although the concept of creep-up is not new to the claimed invention, Inaba contains no discussion or disclosure of this phenomenon. Furthermore, as shown in Table 1 of the specification, the creep-up amount relates to the thermal resistance and it would not have been a matter of routine experimentation to experiment with the creep-up amount to manufacture a device with the claimed thermal resistance and creep-up limitation. The combination of thermal resistance and creep-up amount is claimed and the claimed ranges would not be a mere matter of routine experimentation, even if Inaba disclosed either of these features. Furthermore, claims 3 and 4 are allowable at least due to their dependency from claim 2. Accordingly, Applicants respectfully request that this rejection be withdrawn.

Claim 5 is rejected under 35 USC 103(a) as being unpatentable over Inaba in view of Masayasu (JP 08-095504). This rejection is respectfully traversed.

Claim 5 recites a silver paste. As stated previously, Inaba only discloses a thermoplastic resin. Even if Masayasu discloses using a silver paste, there is simply no suggestion in Inaba to substitute a thermoplastic resin with a conductive die-bond paste containing a metal because of their inherently different properties and purposes. Furthermore, claim 5 is allowable at least due to its dependency from claim 2. Applicants respectfully request that this rejection be withdrawn.

With regard to the Examiner's comments in item 9, on pages 4-5, Applicants wish to make the following comments.

Merely because a reference teaches operating above a certain threshold does not render a claim which recites a limit which is below that threshold obvious. Even if it were known to have a thermal resistance *above* 100°, the claim recites a thermal resistance *below* 90°. This does not support the claimed limitation. Furthermore, merely stating that this is "nothing new" is improper and not a proper basis for rejecting a claim. Furthermore, it may be known that you *can* apply pressure to a chip in many different ways, but the prior art does not disclose applying pressure so the manner in which it is applied makes no difference. Finally, with regard to the Hainz reference, the Examiner asserts that it has been held that the omission of a function in combination where the remaining elements perform the same function involves only routing

skill. Applicants respectfully disagree with the Examiner's interpretation of the claim. Claim 1 recites curing the die-bond paste two separate times. One of the curing steps is done with heat and pressure so that the chip is fixed immobile to the base portion, thus allowing for control of the thickness of the die-bond paste (to 5 μm or less) and control of the thermal resistance (see specification, paragraph [0014]). Furthermore, the viscosity of the die-bond paste is increased, the creep-up height can be controlled. Then the claim recites a final curing step. Merely curing only once, as in Hainz, does not realize the advantages realized by the claimed temporary curing, such as controlling the creep-up height. Therefore, the cited art does not perform the equivalent function in the single step process disclosed therein.

In the event that the transmittal letter is separated from this document and the Patent Office determines that an extension and/or other relief is required, Applicants petition for any required relief including extensions of time and authorize the Commissioner to charge the cost of such petitions and/or other fees due in connection with the filing of this document to **Deposit Account No. 03-1952** referencing docket no. 204552021700.

Respectfully submitted,

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